Geoscientific Instrumentation Methods and Data Systems
Discussions

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Comment on gi-2021-19

Anonymous Referee #1

Referee comment on "A towed magnetic gradiometer array for rapid, detailed imaging of utility, geological, and archaeological targets" by M. Andy Kass et al., Geosci. Instrum. Method. Data Syst. Discuss., https://doi.org/10.5194/gi-2021-19-RC1, 2021

Thanks for a well-written article. It's clear that you have put a lot of work into the system, which has paid off.

Line 43; You state that the system differs from other systems in two ways; towing design and fluxgate magnetometers.
I did find other systems using fluxgate; for example, Bartington instruments offer a solution (https://www.bartington.com/archaeology-forensics/), which also use the same magnetometers as you do.
Concerning the towing design, do you find your design superior to other system designs like the Bartington "Non-Magnetic Cart"?

Line 46: Low noise compared to what?

Line 71: Cesium is only one kind of vapour used for optically pumped magnetimeters. You could use "alkali vapor" instead to include all types of optically pumped magnetometers using vapour.

Line 90: What is the argument for using the 1m fluxgate separation? I would expect archaeological structures to be relatively shallow targets.

Figure 1(a): both the IMU and the two antennas are relatively close to the magnetometers; this may cause some magnetic distribution. Furthermore, wires are passing close to the sensors. Since you don't mention it, I assume it's not an issue but have you tested/measured it?

Figure5(a); It is hard to differentiate between the colours. It would be more informative if you came with an estimate of how low a degree you need.

Line 244: 2000nT at 6 degree.

Line 315: I'm rather confused about your noise estimate. Is it 6nT/m or 8nT/m (line 42, 62 and 347)? Do you define your noise floor as one standard deviation? And how do you calculate the noise of the total vertical gradient [nT/m]?

Line 328: What accuracy and resolution of an IMU would be sufficient for your application?